Experiment No.: 05

Name of the Experiment: Single Phase Half Wave Controlled Rectifier with PI Controller

Required Software:

- MATLAB
- Simulink

Objectives:

- To Obtain a Gate Pulse from the Input wave and to Use it in the Half Wave Rectifier Circuit
- Find the Waveform of Mean Value of Output and Observe it in the Scope
- To Use PI controller to set the firing angle
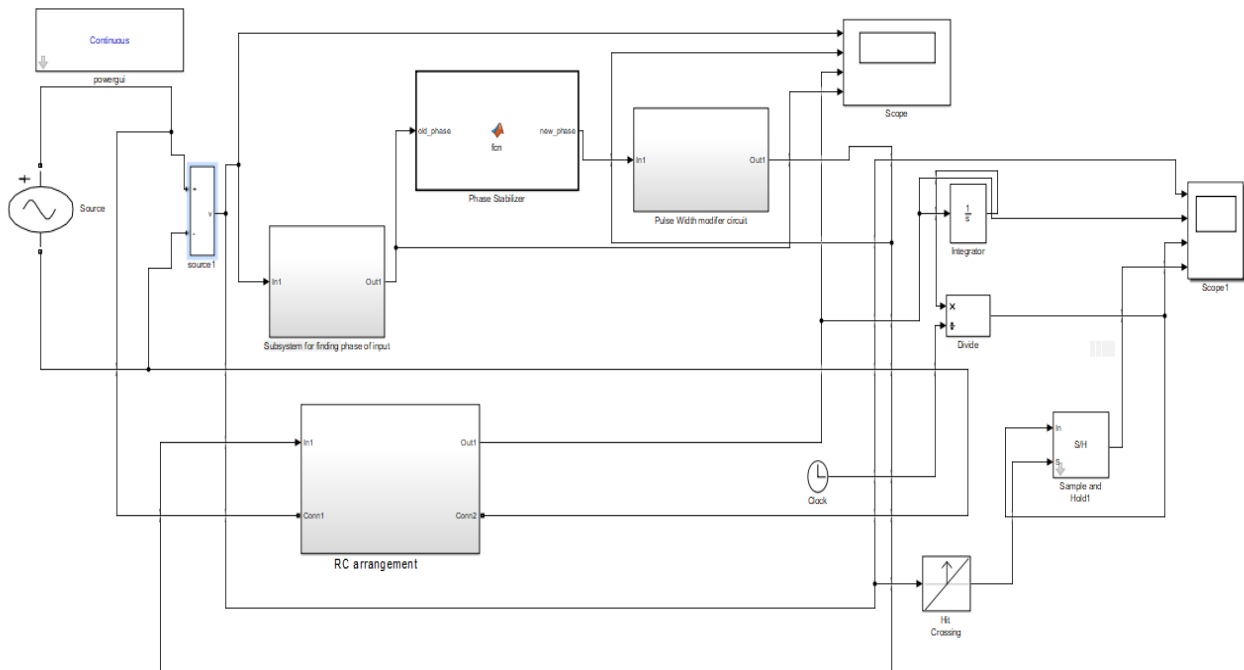
Have-Wave Controlled Rectifier:

Figure 5.1.: Half-Wave Controlled Rectifier Circuit (R=10ohm, C=1000uF, RC Load) block with Firing Angle (90 degree) in Simulink

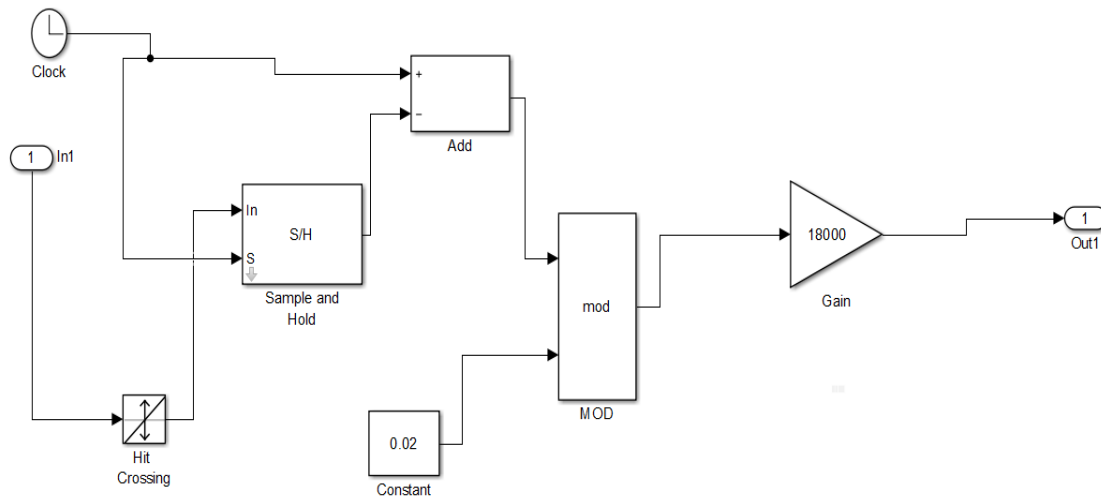Subsystem for Phase of the Input:

Figure 5.2.: subsystem of Circuit Which Generates Phase of Input Signal in Every Cycle in Simulink

Phase Stabilizer or Gate Pulse Stabilizer MATLAB Code:


```
1   function new_phase = fcn(old_phase)
2 -     if old_phase < 358
3 -         new_phase = old_phase;
4       else
5 -         new_phase = 0;
6       end
7
```
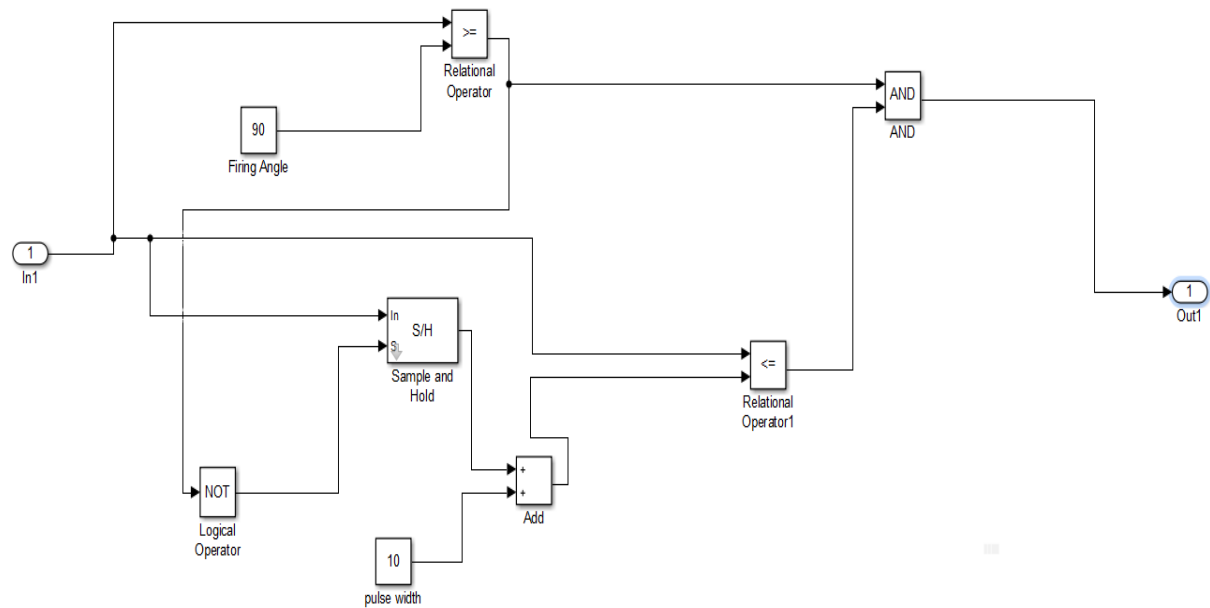
Subsystem of Pulse Width:

Figure 5.3.: Subsystem of Pulse Width Generator Circuit in Simulink

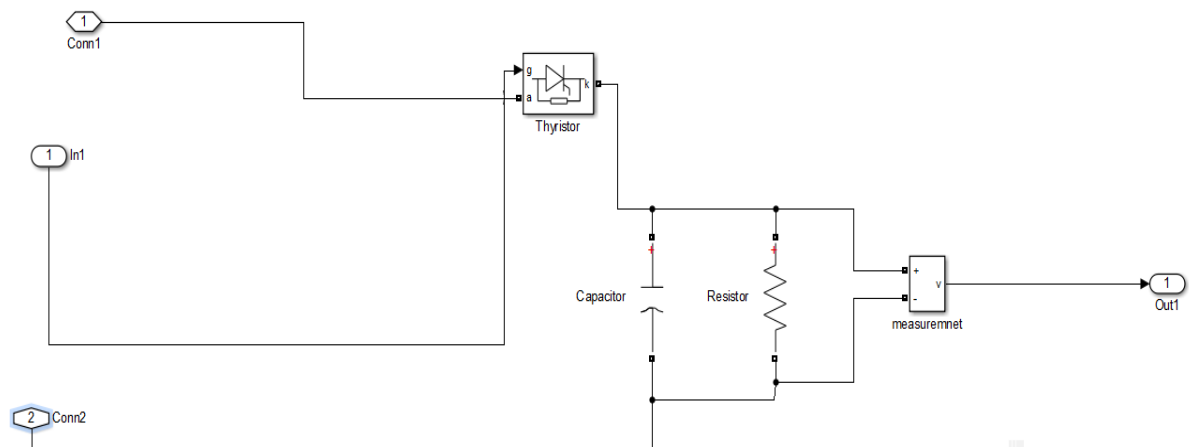Subsystem of Half-Wave Arrangement:

Figure 5.4.: Subsystem of Half-Wave Controlled Arrangement with RC Load in Simulink
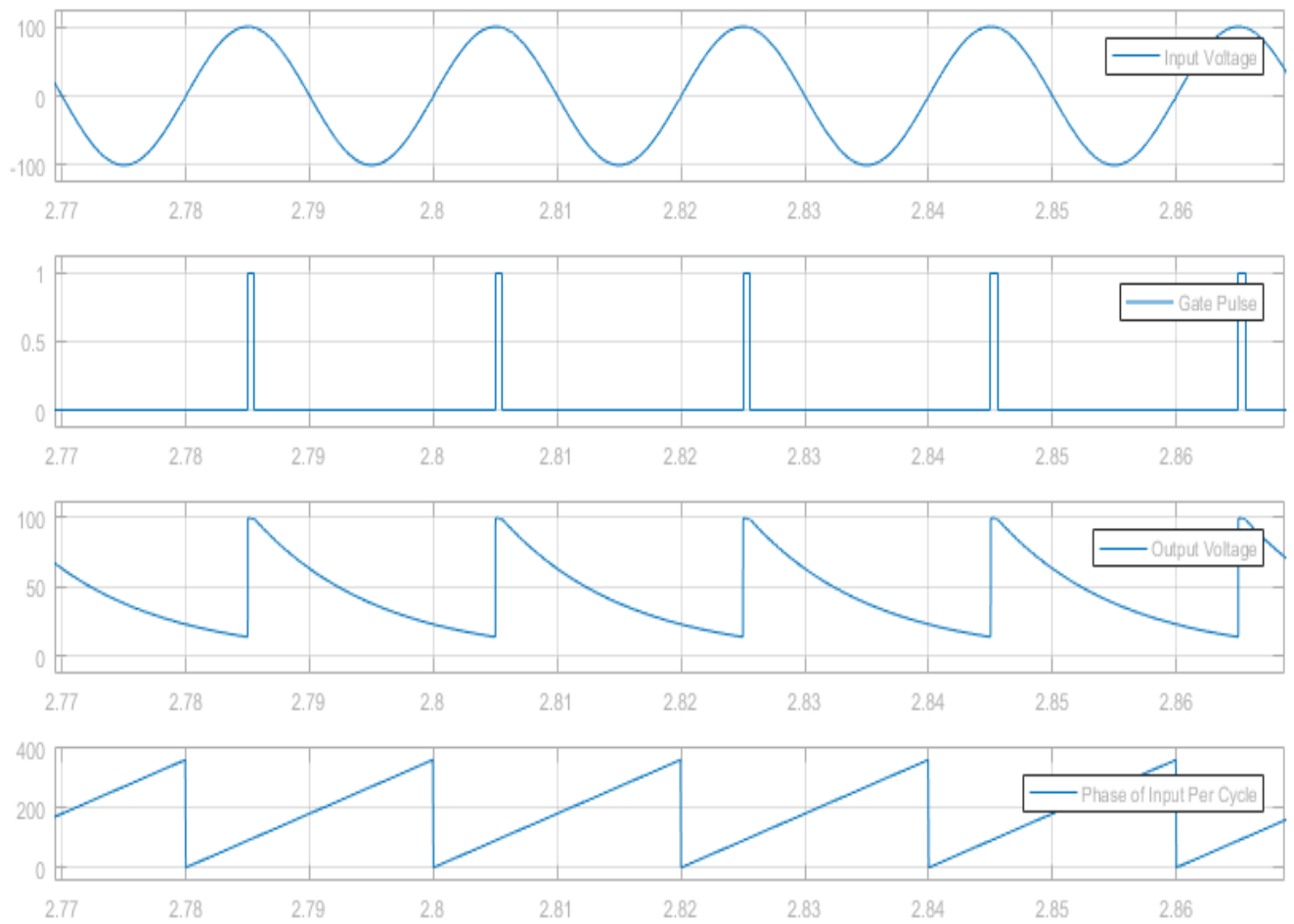
Output:

Figure 5.5.: Input, Gate pulse, Output Voltage and Phase of Input Waveform in Simulink
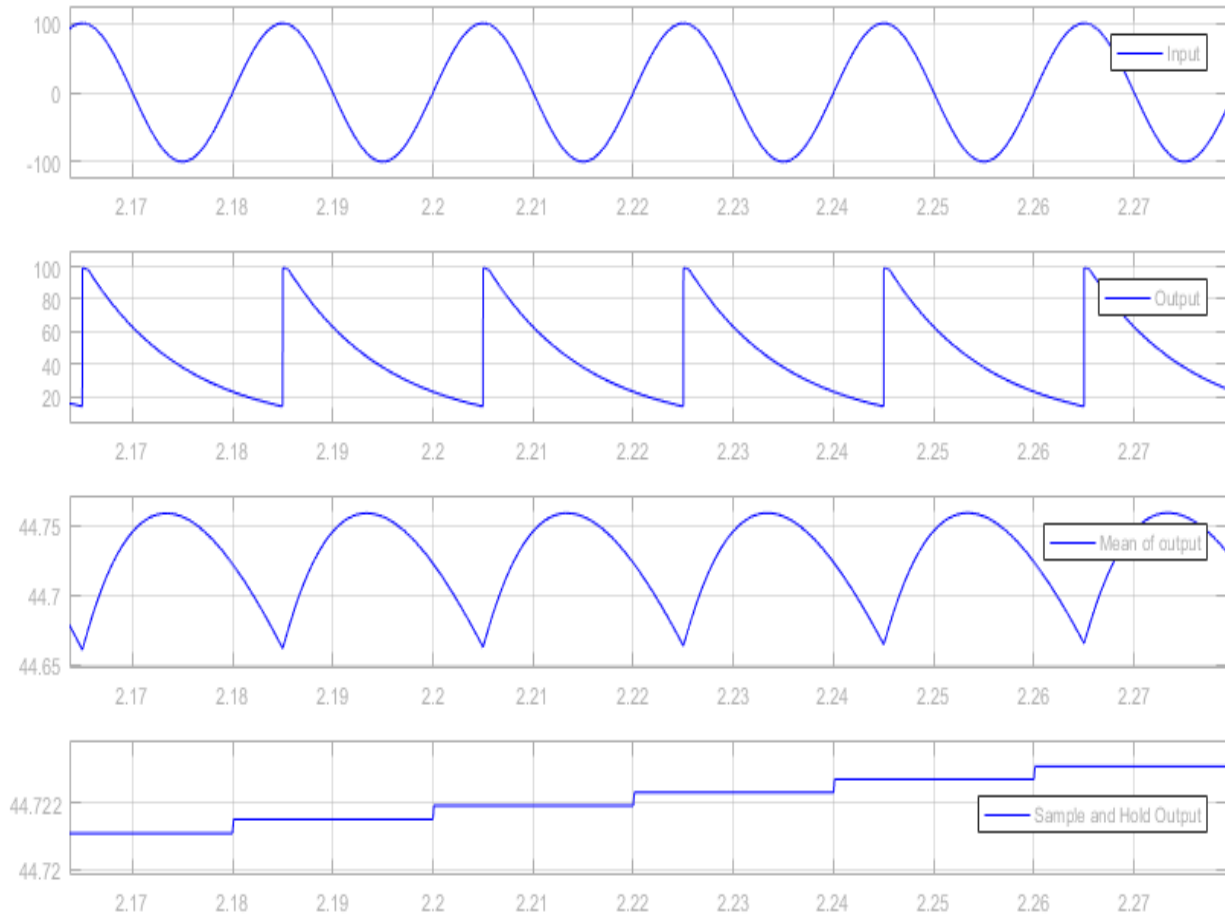
Figure 5.6.: Input, Output, Mean of Output, Sample and Hold Block Output Waveform in Simulink

Discussion: Gate pulse was created and used in the thyristor of half wave circuit. The pulse was modified since it is not needed to active for long only a little bit of trigger pulse is enough for the thyristor to turn on. Then the output of the circuit was seen in the scope and using and integrator, divider and clock the mean value of the output was found and shown in the scope. The whole purpose of this design was to make the circuit easy and suitable for understanding so that PI controller can be used to set the trigger pulse instead of using manually. However, from the experiment the expected result was found and the circuit diagram was designed in the Simulink carefully so the experiment was done successfully.